40394

National Library of Canada | Bibliothèque nationale du Canada

CANADIAN THESES ON MICROFICHE | THÈSES CANADIENNES SUR MICROFICHE

NAME OF AUTHOR/*NOM DE L'AUTEUR* TRACEY M. DERWING

TITLE OF THESIS/*TITRE DE LA THÈSE* THE ACQUISITION OF WH QUESTIONS

UNIVERSITY/*UNIVERSITÉ* UNIVERSITY OF ALBERTA

DEGREE FOR WHICH THESIS WAS PRESENTED/ *GRADE POUR LEQUEL CETTE THÈSE FUT PRÉSENTÉE* MASTERS OF SCIENCE

YEAR THIS DEGREE CONFERRED/*ANNÉE D'OBTENTION DE CE GRADE* 1979

NAME OF SUPERVISOR/*NOM DU DIRECTEUR DE THÈSE* DR. GARY D. PRIDEAUX

Permission is hereby granted to the NATIONAL LIBRARY OF CANADA to microfilm this thesis and to lend or sell copies of the film.

The author reserves other publication rights, and neither the thesis nor extensive extracts from it may be printed or otherwise reproduced without the author's written permission.

L'autorisation est, par la présente, accordée à la BIBLIOTHÈQUE NATIONALE DU CANADA de microfilmer cette thèse et de prêter ou de vendre des exemplaires du film.

L'auteur se réserve les autres droits de publication; ni la thèse ni de longs extraits de celle-ci ne doivent être imprimés ou autrement reproduits sans l'autorisation écrite de l'auteur.

DATED/*DATÉ* APRIL 23/1979 SIGNED/*SIGNÉ* Tracey M. Derwing

PERMANENT ADDRESS/*RÉSIDENCE FIXÉ* 5018 - 147 St

EDMONTON, ALBERTA

T6H 5E7

NL-91 (3-74)

National Library of Canada

Cataloguing Branch
Canadian Theses Division

Ottawa, Canada
K1A 0N4

Bibliothèque nationale du Canada

Direction du catalogage
Division des thèses canadiennes

NOTICE

The quality of this microfiche is heavily dependent upon the quality of the original thesis submitted for microfilming. Every effort has been made to ensure the highest quality of reproduction possible.

If pages are missing, contact the university which granted the degree.

Some pages may have indistinct print especially if the original pages were typed with a poor typewriter ribbon or if the university sent us a poor photocopy.

Previously copyrighted materials (journal articles, published tests, etc.) are not filmed.

Reproduction in full or in part of this film is governed by the Canadian Copyright Act, R.S.C. 1970, c. C-30. Please read the authorization forms which accompany this thesis.

THIS DISSERTATION
HAS BEEN MICROFILMED
EXACTLY AS RECEIVED

AVIS

La qualité de cette microfiche dépend grandement de la qualité de la thèse soumise au microfilmage. Nous avons tout fait pour assurer une qualité supérieure de reproduction.

S'il manque des pages, veuillez communiquer avec l'université qui a conféré le grade.

La qualité d'impression de certaines pages peut laisser à désirer, surtout si les pages originales ont été dactylographiées à l'aide d'un ruban usé ou si l'université nous a fait parvenir une photocopie de mauvaise qualité.

Les documents qui font déjà l'objet d'un droit d'auteur (articles de revue, examens publiés, etc.) ne sont pas microfilmés.

La reproduction, même partielle, de ce microfilm est soumise à la Loi canadienne sur le droit d'auteur, SRC 1970, c. C-30. Veuillez prendre connaissance des formules d'autorisation qui accompagnent cette thèse.

LA THÈSE A ÉTÉ
MICROFILMÉE TELLE QUE
NOUS L'AVONS REÇUE

THE UNIVERSITY OF ALBERTA

THE ACQUISITION OF WH QUESTIONS

by

(C) TRACEY MARY DERWING

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE

OF MASTER OF SCIENCE

IN

PSYCHOLINGUISTICS

DEPARTMENT OF LINGUISTICS

EDMONTON, ALBERTA

SPRING, 1979

THE UNIVERSITY OF ALBERTA

FACULTY OF GRADUATE STUDIES AND RESEARCH

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitled The Acquisition of WH questions submitted by Tracey Mary Derwing in partial fulfillment of the requirements for the degree of Master of Science in Psycholinguistics.

Gerald Prideaux
Supervisor

Lois Muckwood

John T. Hogan

W. T. Fagan
External Examiner

Date 17 April 1979

This thesis is

dedicated to my parents,

Jim and Mary Love

ABSTRACT

The claim that subject-auxiliary inversion in negative WH questions is acquired later than in their positive counterparts is tested in an expanded replication of Bellugi's 1971 experiment. The original results are supported; however, it is argued that the time difference in development is not due, as has been previously suggested, to syntactic complexity, but rather to semantic and contextual constraints.

An unexpected finding of this study, that positive WH questions and Yes/No questions may develop simultaneously, is interpreted within a functional framework. In addition, the contradictory results of previous research are discussed and an alternative, semantically-based hypothesis is formulated to explain them. It is argued that more data must be collected before any conclusions can be drawn concerning the relative rates of development of Yes/No and WH questions.

ACKNOWLEDGEMENTS

I would first like to thank the administrators of the two daycare centres, McKernan Park and Students' Union, for so kindly allowing me to test the children. And thanks, too, to Mrs. Helen Hawkes for making the initial arrangements.

I owe a great deal to Peter Assmann and Alana Johns, who lent their considerable talents both as puppeteers and child tamers.

My supervisor, Gary Prideaux, who regularly deciphered by scribbles, was ready with a word of encouragement throughout and I am grateful to him for his support.

John Hogan's assistance was invaluable. My mind boggles at the mere mention of numbers and John's task was to "deboggle" me. I appreciated also the comments of Lois Marckworth and Bill Fagan.

The inhabitants of Room 742 and the Sound Lab made writing the thesis a lot of fun. Our frequent sorties through Hysteria Land were very welcome (though sometimes hard on the knees). A special mention is due to Ron Smyth, who read this thesis thoroughly and offered a number of helpful suggestions.

Last and most especially, I want to thank my long-suffering husband, Bruce. It's practically impossible to express what I feel without resorting to the standard "acknowledgement-of-one's-spouse" clichés, but I hope he knows how very much his support meant to me.

TABLE OF CONTENTS

Page

CHAPTER ONE: OVERVIEW..... 1

CHAPTER TWO: THE ACQUISITION OF SOME BASIC SYNTACTIC CONSTRUCTIONS..... 4

2.1 Introduction..... 4

2.2 Innate Linguistic Knowledge vs. Cognitive Capacities..... 5

2.3 Negation..... 12

2.4 Interrogatives..... 16

2.5 Summary..... 30

CHAPTER THREE: THE EXPERIMENT..... 32

3.1 Subjects..... 32

3.2 Procedure..... 33

3.3 The Experimental Tasks..... 36

CHAPTER FOUR: RESULTS AND DISCUSSION..... 40

4.1 Results..... 40

4.2 Discussion..... 50

4.3 Conclusions..... 63

REFERENCES..... 64

LIST OF TABLES

Table	Description	Page
1.	Occurrence of Auxiliary Verbs in Questions in Successive Language Samples	27
2.	Analysis of Variance	41
3.	Newman-Keuls Comparison of Means for Sentence Type by Task	43
4.	Newman-Keuls Comparison of Means for Sentence Type by Modality	44
5.	Newman-Keuls Comparison of Means for Sex by Age	45

LIST OF FIGURES

Figure	Description	Page
1.	Sentence Type by Task	46
2.	Sentence Type by Modality	47
3.	Sex by Age	48

CHAPTER ONE

OVERVIEW

In his review of basic issues in first language development, Roger Brown writes that

> All over the world the first sentences of small children are being painstakingly taped, transcribed, and analyzed as if they were the last sayings of great sages. Which is a surprising fate for the likes of "That doggie," "No more milk," and "Hit ball" (1973, p. 97).

These endeavours are not undertaken out of idle curiosity or out of a desire to amass a collection of amusing anecdotes, but rather they are motivated by a desire to understand how people learn. The assumption is that language is such a central and complex aspect of human cognitive activity that discoveries about its development should shed light on the general problem of human intelligence.

Like any other scientific investigation, theories of language development must be built on the basis of the data available; all too often, however, these theories seem to be founded on data which are too limited to support them, or in

some instances, on no firm data at all. To solve this problem, current theories must be examined carefully and critically and new data systematically collected to fill the gaps or to resolve controversial issues.

A specific illustration of this general problem is the case of the acquisition of negative WH questions (e.g., Why aren't you limping?). Apart from some scattered naturalistic observations, the only data available on this subject come from one small experiment involving a single child (Bellugi, 1971). This small sample provides the only empirical basis for the broad and sweeping claim that the order in which the grammatical constructions are acquired can be explained in terms of syntactic complexity measures based on a transformational analysis of the sentence types involved. Since, as will be shown below, the linguistic theories alluded to in this putative explanation are inadequate on independent grounds, it is important to establish that the basic data in this area are themselves accurate before moving on to the construction of new and more adequate theories.

Chapter Two below consists of a review of the literature relevant to this study; Chapter Three presents the details of an experiment designed to test the claims of previous research on the developmental sequence of WH questions. This experiment extends the data base to 24 children of varied backgrounds. It also insures that a

variety of both positive and negative questions are tested. The results confirm prior findings in some areas and contradict them in others. The theoretical import of these findings is discussed in Chapter Four, where two functionally-based alternatives to the traditional transformational analysis are offered as possible explanations.

CHAPTER TWO

THE ACQUISITION OF SOME BASIC SYNTACTIC CONSTRUCTIONS

2.1 Introduction.

In this chapter the literature on the acquisition of English negative and interrogative constructions is reviewed. Although the focal issue of this thesis is the development of negative WH questions, it will be useful to examine briefly some general trends in the investigation of first language acquisition as well, in order to establish a background for the present study.

Much of the information reported on child language is based on naturalistic data which investigators have collected over extended periods of time (cf. Limber, 1970; Slobin & Welsh, 1973; Brown, 1973; etc.). These informal longitudinal studies bear close examination for clues as to how a child's linguistic abilities develop. Occasionally, researchers primarily involved in naturalistic observation have supplemented their findings with data derived through experimental techniques; however, much more extensive experimentation is warranted.

Because of heavy reliance on naturalistic data, claims made about language acquisition are often based on very limited samples, with little controlled or systematic evaluation of alternative hypotheses. The generality or representativeness of the naturalistic data is open to serious question, since so often the children studied are the first-born of college-educated parents and have no siblings. Since in many instances the child under observation is the offspring of the researcher himself, one suspects that the child is exposed to, and is encouraged to exhibit, more word play than the average child, and it may well be the case that such children are not representative of the norm. Data drawn from a limited or skewed sample must be recognized for what they are and cannot be assumed to provide reliable or valid estimates on which to draw general conclusions about the nature of the language acquisition process.

The remainder of this chapter is devoted to some of the important issues in the study of the nature of language acquisition, followed by a survey of the principal investigations of negatives and interrogatives which have appeared in the literature.

2.2 Innate Linguistic Knowledge vs. Cognitive Capacities.

Language acquisition research over the past fifteen years has been approached from two radically different

viewpoints - those of the nativists and of the empiricists. Investigators such as McNeill (1966, 1968) maintain that children rely on innate, biologically-endowed knowledge of grammatical relationships in learning a language. The proposed innate properties are strikingly similar to certain aspects of the base structures in syntactic theories proposed by transformational grammarians. For example, McNeill (1966) has proposed that the "configurations of the base structure of sentences" (p. 102) are innate linguistic universals. It should be noted that these configurations are arrived at through ad hoc techniques which have no psychological justification; not only are they exclusively syntactic, but simplicity considerations figure very heavily in determining their shapes. McNeill and others argue that only on the basis of innate linguistic knowledge of this kind are children able to sort through the complexity and abstractness of language. McNeill has summarized his position on this issue as follows:

> [I]t appears that children do identical things in the face of radically different conditions of learning. The proposal that linguistic theory represents children's capacity for language accordingly gains empirical support.... [T]he forms underlying negation (Bellugi, 1964...) and interrogation (Bellugi, 1965) appear early and can be taken as evidence in favour of the proposal (McNeill, 1966, p. 110).

McNeill is equating the early stages of the acquisition of negatives and interrogatives with "closeness" to the

putative base structure of these sentence types, thereby implying that there is a direct connection between abstract syntax and language learning. This unstated assumption is wholly unfounded.

Brown and Hanlon share McNeill's concept of innateness:

> The immature rules for interrogation and negation may arise as McNeill has suggested because they are much closer to the base structure than are the transformed adult forms. The transformations are certainly language-specific and so must be learned. The base structure has a better chance of being universal and innate (1970, p. 50).

These researchers are concerned primarily with syntactic structure; they appear to follow Chomsky's dictum (1957, 1965) that syntax is central and autonomous; semantics, pragmatics and other aspects of language use, as well as other more general cognitive phenomena, are generally ignored. Bloom recognizes some of these shortcomings in her 1970 publication, Language development: Form and function in emerging grammars. She stresses that language acquisition is inseparable from cognitive-perceptual growth and environmental influence. She also points out that transformational grammar treats deep structure as an underlying syntactic representation, hence ignoring "(1) the distinction between underlying and superficial linguistic structure and (2) the essential relevance of the semantics of a sentence for the specification of its structure." In other words, Bloom

appears to view deep structure as a semantic rather than a syntactic representation. Despite her misgivings on these specific points, however, Bloom's work is still largely done within the transformational-generative framework, as will be shown below.

Slobin's 1971 article, "Cognitive prerequisites for the development of grammar," is a milestone in the study of language acquisition. Slobin adopts the position that children have general cognitive capacities which enable them to learn a language. He offers convincing evidence for his "primacy of cognitive development" stance, which suggests that in order for a child to construct a grammar, he must be able to "cognize the events encoded in language" and he must "process, organize and store linguistic information" on the basis of these prior cognitions (p. 299; see also Macnamara, 1972). A central tenet of Slobin's theory is that children are subject to short-term memory limitations which derive from general perceptual and information-processing principles. These principles constrain linguistic performance and differ only in degree from those which are operative in adult speakers. Slobin also proposes a number of psycholinguistic universals and corresponding "operating principles" based on observations from some forty different languages.

A number of researchers have recently come to realize that there is a great deal to be gained by studying the

child's acquisition of language in the context of discourse interaction. This approach had been ignored for some time, largely because of the linguists' faith in the innateness of base structures and because of the (unfounded) assumption that the child could not possibly detect regularities in the chaos of ill-formed and elliptical speech to which he was thought to be characteristically exposed. Shipley, Smith, and Gleitman's attitude is typical of this view:

> Chomsky has argued with much justice that a comparison between a haphazard sample of speech and the grammar itself (presumably a representation of the way that language is ultimately organized in the mind) leaves little doubt that the task in inferring the latter from the former is difficult to the point of improbability (1969, pp. 337-338).

But just how "haphazard" is the speech that the child actually hears? Chomsky proposed the innate "language acquisition device" (LAD) to account for the acquisition of syntactic competence; according to him, the child hears only "degenerate" and very "limited" samples of a very complex language, and an innate, specifically linguistic device of this kind is the only possible explanation for the child's rapid mastery of grammar (Chomsky, 1965, pp. 56-58). Researchers who have actually studied the linguistic environment of children, however, see the matter in a rather different light. Newport, Gleitman, and Gleitman (1975), in a paper which appeared six years after the Gleitman study just cited, found that mothers do not address their children in typical "degenerate" adult language but, rather, they use

"acoustically clean, grammatically well-formed, simple, and repetitive" speech (p. 111). Ervin-Tripp (1970) has also noted that speech directed at children is "rich in questions, very repetitive and consists of short utterances with few errors and false starts" (p. 81). Mothers thus seem to be very closely attuned to their children's linguistic capabilities and tailor their own discourse accordingly. In addition, the "limited" samples to which Chomsky refers have been shown to be quite extensive, in fact. Suppes (1976), for example, has estimated that between the ages of two and three years the average child hears "from his parents and other persons almost a million utterances" (pp. 235-236).

It is also quite likely that children, using something akin to the operating principles proposed by Slobin (1971), adopt strategies of their own to simplify or bias their linguistic input. Smith (1970) states that

> On the basis of our experimental data, we doubt that these children attend very much to the adult parts of adult speech. More generally, then, we doubt that their primary linguistic input is as rich or as confusing as has sometimes been suggested (p. 118).

Moreover, the child is not limited strictly to syntactic information. He also has access to and makes use of a variety of contextual factors, as Ervin-Tripp (1974) points out.

Brown (1968) agrees with the nativists that the surface

data seem inadequate when considered in isolation, that is, "in too static a form, as a set of still photos, unconnected model sentences" (p. 288). He differs, however, in thinking that it is the "changes produced in sentences as they move between persons in discourse [that] may be the richest data for the discovery of grammar" (p. 288). Syntax, in short, is not transmitted in a vacuum; the child has myriad perceptual cues to draw on over and above those provided by the linguistic utterance itself, and a variety of general cognitive abilities which he can use to make sense out of what is said to him and to help him organize his grammatical knowledge of the language.

These research developments suggest that much more is involved in the learning of language than the mere mastery of syntax. The context of an utterance as well as its form, is absolutely essential to its interpretation; therefore, a grammar which incorporates this sort of information is bound to approximate more closely the child's actual linguistic knowledge than one based on syntactic relationships alone. While the "autonomy of syntax" position may be a convenient one for linguists dealing with language as a collection of texts (e.g., sentences), it is not at all a plausible position for the linguist concerned with language learning or language use.

2.3 Negation.

The first extensive examination of the child's acquisition of negation is Klima and Bellugi's "Syntactic regularities in the speech of children," which appeared in 1966. The authors begin by outlining the standard transformational approach to negation in adult speech, which postulates a pre-sentential NEG morpheme in the deep structure. This morpheme is moved by transformations to an eventual surface structure position following the tense marker and first auxiliary. This "adult grammar" account of negation is taken as the language learner's goal or end product. The syntactic constructions discussed are negation and auxiliary verbs, negative imperatives, and negation and indefinite markers, all of which are described in terms of various phrase structure and transformational rules.

Klima and Bellugi investigated three periods (not to be confused with the stages later proposed by Brown, Cazden, and Bellugi, 1969) in the development of negation; they were defined on the basis of the children's mean length of utterance (MLU), a measure first suggested by McCarthy (1954) as being the most "reliable, easily determined, objective, quantitative and easily understood measure of linguistic maturity" (pp. 550-551). The authors stress that they are interested not in discovering semantic concepts or basic grammatical notions, but rather in the "lower level syntactic phenomena like position,

permutability and the like" (p. 191). In other words, their aim is to examine form while ignoring function. Klima and Bellugi's period 1 (MLU=1.75) is characterized by the fact that the negative element (no or not) resides outside the nucleus of the sentence, as in the utterance, No the sun shining. McNeill (1968), in his work on acquisition of negation, is encouraged by this finding because it supports the nativist theory that the underlying NEG element is located at the beginning of the deep structure of English sentences. Lord (1974) has argued, however, that Klima and Bellugi have been too quick to generalize their findings. She notes that her own daughter never exhibited the proposed pattern of NEG + nucleus and, in fact, her child first indicated negation by means of a unique intonation pattern.

Klima and Bellugi also state that there is no evidence to suggest that children even understand the negative embedded in the auxiliary of adult speech. It would be interesting to investigate this easily testable hypothesis, as it has been shown by a number of researchers (e.g., Fraser, Bellugi, & Brown, 1963; Shipley, Smith & Gleitman, 1969) that comprehension normally precedes production. It may simply be that the negative appears in sentence-initial position merely because it is of greatest semantic import to the child, as it may be in general. Moreover, as Klima and Bellugi themselves point out, mothers often reinforce their negative statements, as in No, you can't have that. Consequently, the child may be operating on the basis of

saliency and surface structure.

In period 2 (MLU=2.6) Klima and Bellugi find that the first auxiliaries to appear are do and can , but only in their negated forms (i.e., as don't and can't). They choose to regard these as alternatives to not , rather than as true auxiliaries. The negative element (no, not, don't, can't) occurs within the utterance at this stage, rather than outside the sentence nucleus. There is also evidence from naturalistic observation at period 2 that the child understands negatives attached to auxiliaries in adult speech.

By period 3 (MLU = 3.5) the modal auxiliaries can and do are present in affirmative sentences, and other auxiliary verbs appear in both positive and negative utterances. At this time such indeterminate forms as some or something also begin to occur and extend to negative sentences (Bellugi, 1971).

In an attempt to systematize the acquisition of negation at these early stages, Klima and Bellugi provide a number of transformational rules to describe the utterances found at each of the three periods. They conclude that the acquisition of negation involves the learning of the transformations they posit. In fact, the Klima and Bellugi paper is a classic example of a genre of research in suggesting that children learn transformations in the absence of any semantic or functional constraints.

In contrast, Bloom (1970) approaches the early stages of the acquisition of negation from a semantic viewpoint. She uses the method of "rich interpretation" in determining the semantic intent of a two or three word utterance; that is, she attends to the situational context for insights as to the child's intended meaning. Bloom found that at the earliest stage of negation (Klima and Bellugi's period 1), the child has only one syntactic form to express the three distinct semantic functions of nonexistence, rejection, and denial. She states that

> The acquisition of linguistic expression did not proceed hand in hand with cognitive-semantic development. Learning to express a new semantic category of negation did not involve a new structure for its linguistic expression at the same time (p. 217).

This finding is evidence of Slobin's principle, which Prideaux (1979) calls <u>functional exploitation</u>, that new functions are first expressed by old forms.

Bloom proposes that the child employs "reduction transformation rules" to delete portions of a sentence. She maintains that the child has the grammatical relations of an adult but must reduce utterances because of syntactic complexity. It has been argued by Brown (1973), however, that the existence of reduction transformations is highly implausible. This is because "The notion that development proceeds from the more complex to the less complex, that rules are dropped as the child develops, is not in accord

with our expectations in these matters". (Brown, 1973, p. 239). The need to posit these rules is an unfortunate consequence of Bloom's fundamentally transformational orientation. She is forced to posit reduction rules in order to account for all deviations from adult simple declarative structures. She does not consider the possibility of an alternative theory which disallows "movement rules" and posits instead distinct surface structures for distinct semantic functions (cf. Prideaux, 1976).

2.4 Interrogatives.

Klima and Bellugi (1966) trace the development of both negatives and interrogatives and find that the two processes parallel one another. In period 1, Yes/No questions lack auxiliaries and no subject - verb "inversion" occurs (the term inversion will be used throughout this thesis in the sense of subject-verb placement; no movement or transformation is implied unless otherwise stated). The questions are marked solely by rising intonation, an acceptable but relatively infrequent form in adult English. Klima and Bellugi describe the syntax of Yes/No questions during this period with the following phrase structure rule:

S —> Q(Yes/No) + Nucleus

At this time, WH questions are limited to what and where (e.g., What dat?). Other researchers (Ervin-Tripp, 1970; Tyack & Ingram, 1977) report the same developmental order.

Frequency of exposure may be a factor here, as Brown, Cazden, and Bellugi (1969) and Savić (1975) have reported that three-fourths of the WH questions mothers address to children are locative. Brown, et al. ranked the order of appropriate responses to the mothers' WH questions as where > when > why > how, but noted that the data for when were unreliable. Strangely enough, what was not included in the ranking at all. This seems particularly odd in view of the fact that Brown (1968) reported that this was the most frequent question of both mothers and children (p. 283). Ervin-Tripp (1971) also provides evidence that the child's comprehension of what and where questions precedes that of all other WH question forms.

Klima and Bellugi's data include some correctly formulated WH questions at period 1 (e.g., What's that?) which they claim are learned routines rather than syntactically developed sentences. No evidence of negative WH questions was reported. By period 2, children are capable of responding appropriately to both Yes/No and WH questions. At this point there is still no inversion in Yes/No questions, and auxiliaries do not yet occur in WH questions; however, negative questions are now introduced, and the negative element (no, not, don't, can't) is incorporated into the nucleus (e.g., Why not he eat? and You can't fix it?). The authors summarize period 2 with the following phrase structure rule:

$$S \longrightarrow \left\{\begin{matrix} Q(Yes/No) \\ Q(what) \\ Q(where) \\ Q(why) \end{matrix}\right\} + \text{Nucleus}$$

Period 3 marks the first appearance of subject-verb inversion in Yes/No questions and the use of do as a dummy auxiliary. As yet, no combinations of auxiliaries are produced. In contrast to the Yes/No question, most WH questions in period 3 lack do in its capacity of auxiliary verb (e.g., What you have in your mouth?) and there is still no subject-verb inversion (e.g., Why kitty can't stand up?) Klima and Bellugi suggest the following base structure for period 3, as well as the three transformational rules indicated:

$$S \longrightarrow (Q(WH)) + NP + AUX + VP$$

$$AUX \longrightarrow T + V(Aux) + (NEG)$$

$$V(Aux) \longrightarrow \left\{\begin{matrix} can \\ do \\ will \\ be \end{matrix}\right\}$$

$$NP \longrightarrow WH + \text{Indeterminate}$$

T1: Interrogative Word Preposing

T2: Interrogative Inversion
(Yes/No questions only)

T3: Do Deletion

It is somewhat anomalous that both the Q and NEG elements are, according to transformational theory, sentence-initial options in the deep structure of English questions, yet the WH word is not considered to be a

realization of Q. As noted earlier, McNeill (1968) took Klima and Bellugi's finding that the child's first expression of negative occurs outside the sentence nucleus as support for the proposed position of NEG in the base structure. Why, then, does he not look upon WH questions in the same light, since children invariably produce WH words at the beginning of an utterance? This is an interesting inconsistency in transformational-generative theory, one that reveals the arbitrariness of the assumption that deep structures are in any way related to child language.

Despite its flaws, Klima and Bellugi's article represents the first serious attempt to systematize regularities in the child's acquisition of negative and interrogative constructions and, as such, it is a useful starting point for any future investigations.

Roger Brown's 1968 article, "The development of WH questions in child speech," constitutes the closest examination of WH questions based on the longitudinal data from the three children dubbed Adam, Eve, and Sarah. Like Klima and Bellugi, Brown defines linguistic development in terms of levels based on MLU, although Brown's levels do not correspond exactly to Klima and Bellugi's. The stages investigated by Brown are as follows: level I (MLU=1.75), level II (MLU=2.25), level III (MLU=2.75), level IV (MLU=3.50), and level V (MLU=4.00). Beyond level V, MLU is not considered to be a reliable measurement of linguistic

knowledge. The author does not make any distinctions in the development of positive vs. negative WH questions.

Brown's analysis of levels I and II is similar to Klima and Bellugi's in that he claims the most frequent of all questions, What's that?, is an independent routine (p. 282); practically no other WH questions occur at this stage. Brown offers as support for this analysis the fact that the questions are more or less invariant; in addition, the children usually fail to comprehend WH questions addressed to them. At this stage the child also indicates Yes/No questions only by means of the device of rising intonation. It is between levels III and V that Brown finds the greatest development in WH questions. By this point the child is not only able to understand WH words but is also able to produce a variety of WH interrogatives.

Because Brown holds to the principles of transformational grammar, he assumes that two transformation rules, preposing and subject-auxiliary inversion, must participate in the derivation of a well-formed WH question. One might predict, then, that the first form of a WH question to develop would be what Brown calls the "occasional question," whose derivation involves neither of the transformation rules just mentioned (e.g., John will read where?). Actually, this question-type practically never appears in the speech of children; in its place Brown found two classes of sentences which he called "intermediate

strings." In both types the WH word appears in sentence-initial position (a fact which would seem to lend credence to a surface structure approach to WH questions, though Brown maintains that the preposing transformation is operative).

The first category of intermediate strings Brown calls "preposing weak" sentences (e.g., What you want?). He explains his choice of terminology as follows: "the thing that is weak is the evidence that questions of this class are produced by preposing" (p. 284). As Brown illustrates, this class of sentences could just as easily be described as having undergone "telegraphic reduction." This is the familiar pattern common to young children of omitting grammatical markers and other "function" elements and preserving only the major lexical or "content" elements of adult speech.

Brown's second category, the "preposing strong" questions, includes (a) inflected sentences, such as What he wants?, and (b) sentences containing auxiliaries or the verb be, as in What you will want? and What his name is? Brown claims that these sentences provide strong evidence for the preposing transformation because there are "no adult models from which they can be produced by telegraphic reduction" (p. 285). It is true that adults do not use either form of the proposing strong question, but this is not to say that children are not exposed to these constructions. In fact,

the word order involved corresponds exactly to that of a well-formed relative clause (e.g., The store where he went is on the corner) or to a complement clause (e.g., I wonder what he wants). Interestingly enough, Miller (1964) found in a longitudinal study of five children that relative clauses involving WH words appear at just about the same time that WH questions are mastered. Very possibly there is some sort of interference between these two construction-types (cf. Prideaux, 1979). It may also be the case, as has already been suggested here in connection with the acquisition of negation, that the subject noun phrase is of primary semantic import to the child and is therefore placed in as prominent or salient a position as possible.

Brown is also reluctant to abandon the idea that the occasional question plays an important role in early development of interrogatives, despite the fact that children rarely, if ever, produce it. This is consistent with his view that children actually learn question transformation rules, but his arguments are very weak.

Occasional questions fall into four general categories with respect to semantic function: "say again," "say constituent again," "constituent prompt," and "supply antecedent." Brown believes that the discourse interaction between mother and child involving each of these occasional question frameworks serves to clarify grammatical relations for the child and thus helps him to develop the basic

grammatical knowledge required for the later acquisition of transformation rules. Brown's claim that the occasional question represents the earliest stage of the acquisition of WH questions is based on evidence from the way in which children answer such questions, rather than from the way in which they produce them. Specifically, when a child is first asked a normal WH question, followed by an occasional question, the child answers only the latter. For example:

Mother: What are you going to do? (Pause)
You are going to do what?

Child: Drink.

Brown concludes from this that the normal and occasional questions are equivalent in meaning, but that the latter are easier to understand. Brown, Cazden, and Bellugi (1969) make similar claims in the context of the occasional question as a prompt: "The occasional form was, in fact, more likely to elicit an appropriate answer than was the normal form" (p. 72).

This conclusion seems to be based on a number of faulty assumptions. First of all, occasional questions are surely not equivalent in meaning to normal WH questions; there is very clearly a contextual difference between the two that alters their content and their communicative function. In addition, the child's response to the second question does not necessarily indicate that he failed to understand the first. The factor that may be of most importance here is that the child is being questioned twice. It is possible

that the first, normal question serves as an attention-getting device; in that case, a repetition of the normal question form might prove to elicit a response just as readily as an occasional question. It would be a relatively straightforward matter to test this alternative hypothesis through experimentation. One might also conjecture that the child had understood the first question but had not yet had time to formulate his answer when his mother asked the occasional question. The mother's use of the occasional question in this situation is not, in any event, a unique feature of Motherese discourse, since such rephrasing is also a a common feature of adult-to-adult usage. Even if Brown's point is conceded here that occasional questions are easier for children to understand than normal questions, this does not necessarily constitute evidence in favour of the WH preposing transformational rule. It may well be that occasional questions are more easily comprehended, but by reason of the recency effect, e.g., the child may be applying Slobin's operating principle A, "pay attention to the ends of words" (Slobin, 1971, p. 335).

Brown's final argument for the occasional question as the first stage in the development of WH questions is that it provides

> a large amount of structural information... with unusual clarity.... It may be accidental, but in our material the occasional form was used much more frequently by the mothers of the two children whose grammatical understanding developed more rapidly

(1968, pp. 289-290).

For additional support, Brown cites a similar phenomenon with regard to the expansion process, where "it was the mothers of the two more rapidly developing children who had the higher expansion rates" (p. 290). He neglects to mention that Cazden (1965) determined that expansions (i.e., an adult's repetition of a child's utterance, adding appropriate "function" words according to the context) did not significantly aid the child's linguistic development. Instead, as Bushnell and Aslin (1977) suggest, expansion in Motherese may simply be a device to elicit feedback whereby the mother can check her own interpretation of the child's reduced utterance. The same principle would also explain much of the mother's use of the occasional question (cf. the categories "say again," "say constituent again," etc.).

It is extremely doubtful that the use of the occasional question itself would promote an earlier than average grasp of the grammatical relations involved in WH interrogatives. It would seem that the mothers of the two more rapidly developing children were, on the whole, more verbal than the third mother in Brown's study. It stands to reason that the more exposure a child gets to direct communication involvement, the faster he will learn his language. Newport, Gleitman, and Gleitman (1975) present evidence suggesting that this is so. In a study of Motherese, the authors found that the more frequently mothers produced

auxiliary-fronted Yes/No questions, the more quickly their children learned to produce auxiliaries in their own speech, whereas the more frequently the mothers produced imperatives, which lack subject nouns and auxiliaries, the more slowly their children learned to produce both noun phrase constructions and auxiliaries (p. 114).

In summary, these findings have two significant implications for the development of WH questions and, in fact, for the acquisition of language in general. First, the amount of a mother's verbal interaction with a child can greatly influence that child's rate of linguistic development, and, second, the role of surface structure regularities has been a heretofore underestimated factor in the child's eventual mastery of grammar.

Bellugi's 1971 article, "Simplification in children's language," which inspired the experiment reported in this thesis, is in many respects a sequel to Klima and Bellugi's 1966 study of the acquisition of negation and interrogatives. The author's primary interests are the child's syntactic simplifications and his systematic deviations from adult speech. One instance of simplification is manifested, according to Bellugi, in the the development of auxiliary inversion in questions. The data upon which her claims are based are taken from the naturalistic study of one of Roger Brown's three subjects, the boy Adam. Table 1 on p. 27 summarizes the occurrence

Table 1

Occurrence of Auxiliary Verbs in Questions in Successive Language Samples.

	YES-NO				WH-			
	Affirmative		Negative		Affirmative		Negative	
Period	Non-inverted	Inverted	Non-inverted	Inverted	Non-inverted	Inverted	Non-inverted	Inverted
A	0	0	0	0	0	0	0	0
B	1	0	0	0	3	0	2	0
C	7	198	0	3	22	8	9	0
D	*	*	*	*	5	33	5	0
E	*	*	*	*	4	27	0	5

(Data are for one child.)

*Data not reported; performance essentially perfect (i.e., auxiliaries always inverted.)

(Adapted from Bellugi, U. Simplification in children's language.)

(This table is taken from D.J. Foss & D.T. Hakes, Psycholinguistics: An introduction to the psychology of language. Englewood Cliffs, N.J.: Prentice-Hall, 1978, p. 260.)

of auxiliary verbs in Adam's production of questions over five developmental periods.

In her discussion of Yes/No questions, Bellugi points out that auxiliary verbs start to appear regularly in positive and negative declarative sentences, Yes/No questions, and WH questions, once the MLU exceeds 3.5. Interestingly enough, she reports an immediate grasp of the inverted form of the Yes/No question, despite the fact that she regards both inverted and non-inverted forms as being equivalent in terms of both "communication" (i.e., information content) and grammaticality:

> [Children] almost invariably produce questions with the auxiliary verbs and the noun-phrase subject inverted in yes/no questions, once they begin using auxiliary verbs with any regularity (p. 98).

Bellugi also mentions a "mixed form" which occurs in both Yes/No and WH questions (an example of the first type is Did I didn't mean to?), but she claims that these utterance types were so infrequent as to be of little importance. Hurford (1975), on the other hand, states that his daughter frequently asked both Yes/No and WH questions of the mixed form type, and he saw fit to formulate an "Aux Copying" transformation rule to account for the phenomenon. Obviously there is room to question Bellugi's out-of-hand dismissal of the mixed form, an issue that will be raised again in Chapter Four below.

Bellugi's data indicate that inversion in WH questions

tends to appear some time later than in Yes/No questions. She concludes that the occurrence of the immature, non-inverted form is due to the syntactic complexity created by the combination of the WH preposing and auxiliary-inversion transformations. Bellugi does note that the lack of inversion in the WH questions produced by the child at this time in no way hampers the communicative act. Indeed, as Prideaux (1979) has pointed out, "Once the child has formulated his initial WH word generalization, he need not also adopt inverted word order, since for him it would...be redundant."

In examining the data for WH questions, Bellugi discovered that there seemed to be a period of several weeks between the appearance of auxiliary-inversion in positive WH and negative WH questions, and so she designed an experiment in order to investigate the phenomenon further. With the help of a hand puppet, she elicited twenty WH questions from Adam - half affirmative and half negative. Adam inverted all of the affirmative questions but none of the negatives (e.g., Why you can't sit down?). Bellugi explains this finding in terms of a performance limitation dictated by syntactic complexity. Although she is aware that the theory of derivational complexity has been discredited in general terms (cf. Fodor & Garrett, 1966; Garrett & Fodor, 1968), she nonetheless seems very attracted to it in this particular case.

2.5 Summary.

In summary, two main problems have emerged from this brief survey of the literature on the acquisition of English interrogatives. First of all, there is clearly a paucity of data on which the major theoretical claims are based. In particular, virtually all of the influential studies refer to findings from a very limited number of subjects; in many cases, in fact, only a single child is involved. Furthermore, the bulk of the investigations in this area are naturalistic rather than experimental in character, and thus provide very little in the way of control on crucial variables. One purpose of the present thesis, therefore, is to expand the data base for at least one facet of the acquisition of questions, using controlled experimental techniques.

The second principal flaw in much language acquisition research has been its reliance on formal linguistic theories which have proved inadequate even for the description of adult competence, much less for the explanation of language development. These theories treat language as a syntactic isolate, hardly connected to its intended function, which is to communicate meaning from speaker to hearer. The second goal of this thesis, therefore, is to attempt to reinterpret the available data on the acquisition of interrogatives within a broader and more appropriate theoretical framework, one which invokes cognitive skills and language functions as

well as syntactic forms.

In the following chapter an experiment based on Bellugi (1971) is reported. The experiment was designed to determine, first, whether Bellugi's findings concerning the acquisition of negative WH questions by a single child could be replicated and generalized to a larger subject population. In addition, the experiment offers a basis for an alternative theoretical treatment of Yes/No and WH question acquisition, a subject which is addressed in the final chapter.

CHAPTER THREE

THE EXPERIMENT

3.1 Subjects.

The 24 subjects were all unilingual English-speaking children residing in the Edmonton, Alberta, metropolitan area. Three age groups were selected: 3.0 to 3.5 years (Group 1), 3.5 to 4.0 years (Group 2), and 4.0 to 4.5 years (Group 3). Each group contained four females and four males. No attempt was made to test children under the age of three years in light of the fact that several potential Group 1 subjects had to be dropped because of their inability to perform the tasks. In addition, one original Group 2 male was replaced by another child because of severe language production problems. The boy seemed to understand what was being asked of him but was unable to respond normally. It was noted that even his spontaneous speech contained a great deal of metathesis and idiosyncratic word order. Thirteen of the children tested attended the University of Alberta Student's Union Daycare Centre; the other eleven subjects came from the McKernan Park Daycare Centre, which is situated in a lower and middle class

residential neighborhood. On balance, the subject sample is probably quite representative of the population at large.

3.2 Procedure.

The experiment involved both an imitation task and a production task. The imitation task was administered first, on the assumption that if a subject failed to imitate he would probably be unable to perform the production task and could be safely excluded from the study. Responses to both parts of the experiment were recorded on a Sony cassette recorder (model TC-110A).

The results of the imitation task are based on 14 stimuli: three positive WH-inverted questions (e.g., Why is the dog barking?), six negative WH-inverted questions (e.g., Why isn't the boy happy?), one positive WH-non-inverted question (Who is hiding?), two negative WH-non-inverted questions (e.g., Who won't run away?), and one positive and one negative Yes/No question (Is the dog black? and Isn't the boy singing?). Since the presence or absence of subject-auxiliary inversion in negative WH questions was the focus of the study, almost half of the stimuli were sentences of that type. The other question types were included to determine whether inversion was productive elsewhere in the child's grammatical system. Although it would have been preferable from the standpoint of the analysis to have had an equal number of each question type,

the attention span of the very young subjects was thought to be too short to accommodate a larger stimulus set than the one used. The order of the sentences was randomized and the same order of presentation was used for all subjects. The subjects were asked to repeat each sentence after the experimenter. On occasion, a child would provide an answer to a stimulus rather than a repetition. In such instances, the instructions and the stimulus sentence were given again. Each child was allowed a maximum of three trials. The full set of stimulus sentences can be found at the end of this chapter.

The production task was patterned after Bellugi's 1971 experiment and took the form of a puppet show in which the subjects were encouraged to participate. Three hand puppets representing a woman, a boy, and a dog were used, along with an artificial tree and some artificial flowers. Subjects were required to ask the puppets a series of questions. Two experimenters manipulated the puppets and responded to the subjects' questions. One of the experimenters also acted as narrator and prompted the subjects with a series of indirect questions designed to preserve declarative sentence word order (for example, Ask John where the flowers are). The complete task can be found at the end of this chapter.

If a child misunderstood what was being asked of him in the production task, the instructions were restated up to three times; each time the prompter would claim that she had

not heard clearly so that the child would not think that his initial response was incorrect. It was considered important to obtain the child's natural form of the question, and not to lead him to think that he had made a grammatical error. The sentences to be elicited in the production task corresponded to those used previously in the imitation task, though the presentation order was different. The stimuli were ordered in such a way as to make a coherent story, which was acted out by the puppets and the child together, in an attempt to make the experimental setting as natural as possible.

Once the data were collected for both tasks, the tapes were transcribed phonemically and the responses were scored. The following types of responses were scored as <u>incorrect</u>: no response, lack of negation or double negation, a missing verb or <u>WH</u> marker, and failure to invert in a Yes/No or <u>WH</u>-inverted question. Other errors, or irregularities due to articulatory difficulties, were ignored. An analysis of the data and discussion of the main findings follow in the next chapter.

3.3 The Experimental Tasks.

IMITATION TASK

1. Why is the dog barking?
2. Why isn't the boy happy?
3. Where are the flowers?
4. What isn't the boy doing?
5. Isn't the boy singing?
6. Who will run away?
7. Is the dog black?
8. Who isn't hiding?
9. Who won't run away?
10. What is the boy doing?
11. What won't happen now?
12. Where isn't the dog?
13. Where aren't there flowers?
14. Why isn't the dog barking?

THE PRODUCTION TASK

Abbreviations: N = narrator (TMD)

S = subject

J = John

L = lady (John's mother)

D = dog

(John comes on stage and hides behind a tree.)

N: Ask the boy what he is doing.

S: (response)

J: I'm hiding from the dog.

(A dog comes out barking.)

N: Ask the dog why he is barking.

S: (response)

D: Because I can't find the boy. Did you see him anywhere?

(John's mother comes on stage.)

N: Here comes John's mother. Ask John who isn't hiding.

S: (response)

J: My mother isn't hiding. She's not afraid of dogs. She probably came out here to pick flowers.

N: Ask the boy where the flowers are.

S: (response)

J: The flowers are there, there, over there, and there.

N: Ask the boy where there aren't any flowers.

S: (response)

J: There aren't any here (points).

(The lady goes over to the dog, pats him, and then starts picking flowers. The dog starts to sniff around and heads for the boy. The lady turns around to watch.)

N: Ask the lady who will run away.

S: (response)

L: John will.

N: Ask her who won't run away.

L: I won't and the dog won't.

J: Mother, where is the dog?

L: Well, he was here just a minute ago, and then he was by the tree, and then....

N: Ask the lady where the dog isn't.

S: (response)

L: He isn't near me.

J: Oh, good. I'll stay by you so you can protect me. (Crying.) I'm really scared!

N: Ask the boy why he isn't happy.

S: (response)

J: I'm not happy because I think the dog will bite me. All brown dogs are mean and like to bite.

N: Ask the boy if the dog is brown.

S: (response)

J: Well, he's <u>almost</u> brown. Tan is pretty close to brown.

L: I think you should try to forget the dog. Why don't you sing a song with me to forget him? (She starts to sing, but the boy doesn't do anything.

N: Ask the boy if he isn't singing.

S: (response)

J: I'm pretending to sing.

N: Ask the boy what he isn't doing.

S: (response)

J: I'm not singing. I don't like to sing. Besides, the dog might hear me and then he'll bark and scare me.

N: The dog hears the boy talking but he doesn't bark. Ask the dog why he isn't barking.

S: (response)

D: I'm not barking because I like the boy. I want to be friends with him.

L: John, I think you should be friends with the dog. He won't hurt you.

J: Yes, he will.

L: No, he won't. (The dog starts to come towards them.) Look, here he comes and he's not even barking. (The dog starts to lick John's face.)

N: The dog is licking John's face. Ask the lady what won't happen now.

S: (response)

L: John won't run away now - and the dog won't bite him because they're friends.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Results.

The data were scored as either correct (1) or incorrect (0). They were then sorted and assigned to appropriate categories so that a percentage correct figure could be obtained for each sentence type by subject.

A five-factor fixed effect analysis of variance was performed in order to determine the effects of sentence type (Yes/No, WH-inverted, and WH-non-inverted), task (imitation or production), modality (affirmative or negative), age, and sex. The results of the ANOVA are given in Table 2 on p. 41. Each main effect, with the exception of sex, was significant. (All significance tests meet the .01 criterion unless otherwise indicated.) In addition to these main effects, there were three significant first-order interactions: sentence type by task, sentence type by modality, and age by sex. Pairwise comparisons of the cell means for each significant effect were made using the Newman-Keuls test (cf. Winer, 1971). The results of the

Table 2

Analysis of Variance

SOURCE	ERROR TERM	F	SUM OF SQUARES	DEG. OF FREEDOM	MEAN SQUARE
1 MEAN	R(CPNAS)	1030.82	130.707	1	130.707
2 C SENTENCE TYPE	R(CPNAS)	7.90**	2.00462	2	1.00231
3 P TASK	R(CPNAS)	22.02**	2.79267	1	2.79267
4 M MODALITY	R(CPNAS)	8.21**	1.04161	1	1.04161
5 A AGE	R(CPNAS)	32.03**	8.12295	2	4.06148
6 S SEX	R(CPNAS)	0.03	0.347212E-02	1	0.347212E-02
7 CP	R(CPNAS)	9.59**	2.43283	2	1.21641
8 CM	R(CPNAS)	6.33**	1.60654	2	0.803272
9 PM	R(CPNAS)	2.23	0.282492	1	0.282492
10 CA	R(CPNAS)	0.54	0.273211	4	0.683029E-01
11 PA	R(CPNAS)	0.67	0.170354	2	0.851769E-01
12 MA	R(CPNAS)	0.17	0.420837E-01	2	0.210419E-01
13 CS	R(CPNAS)	0.11	0.277722E-01	2	0.138861E-01
14 PS	R(CPNAS)	1.21	0.154016	1	0.154016
15 MS	R(CPNAS)	0.52	0.653936E-01	1	0.653936E-01
16 AS	R(CPNAS)	5.58**	1.41542	2	0.707712
17 CPM	R(CPNAS)	0.98	0.249157	2	0.124578
18 CPA	R(CPNAS)	0.24	0.122603	4	0.306509E-01
19 CMA	R(CPNAS)	0.21	0.104562	4	0.261405E-01
20 PMA	R(CPNAS)	1.34	0.339002	2	0.1619501
21 CPS	R(CPNAS)	0.53	0.135100	2	0.675499E-01
22 CMS	R(CPNAS)	0.05	0.124450E-01	2	0.622252E-02
23 PMS	R(CPNAS)	0.99	0.125009	1	0.125009
24 CAS	R(CPNAS)	0.70	0.355631	4	0.889077E-01
25 PAS	R(CPNAS)	0.88	0.221978	2	0.110989
26 MAS	R(CPNAS)	0.04	0.979328E-02	2	0.489664E-02
27 CPMA	R(CPNAS)	0.22	0.110100	4	0.275249E-01
28 CPMS	R(CPNAS)	0.58	0.145866	2	0.729329E-01
29 CPAS	R(CPNAS)	0.81	0.408813	4	0.102203
30 CMAS	R(CPNAS)	0.49	0.250487	4	0.626217E-01
31 PMAS	R(CPNAS)	0.54	0.137478	2	0.687390E-01
32 CPMAS	R(CPNAS)	0.54	0.272615	4	0.681538E-01
33 R(CPNAS)			27.3886	216	0.126799

comparisons can be found in Tables 3, 4, and 5 on pp. 43-45. No higher-order interactions were significant.

The results presented in Tables 3-5 can be summarized as follows:

1. Sentence Type by Task Interaction. There is no significant difference among the three sentence types in the imitation task, as all show a fairly high level of performance. An examination of the three sentence types reveals that both WH-inverted and Yes/No questions are significantly more difficult to produce than to imitate, as seen in Table 3. Also, these two types are mastered at approximately the same age, whereas the who questions, in which no inversion takes place, are learned far earlier. Success in the production of non-inverted WH questions is not significantly different from imitation, with a high level of performance evident on both tasks. Figure 1 on p. 46 illustrates the sentence type by task interaction, and the Newman-Keuls test is shown in Table 3. It is interesting to note that, in general, the ability to produce correct forms lags far behind the ability to imitate them without error.

2. Sentence Type by Modality Interaction. This interaction is illustrated in Figure 2 on p. 47, and the Newman-Keuls comparison of means is found in Table 4. The results of this interaction parallel very closely the previous case. Each sentence type attained a relatively high level of success in the affirmative, but both WH-

Table 3

Newman-Keuls Comparison of Means (Q Values)

for Sentence Type by Task

	Yes/No Production	WHO Imitation	Yes/No Imitation	WH-Inverted Imitation	WHO Production
WH-Inverted Production	.2716	6.1488**	6.3514**	6.6311**	7.3648**
Yes/No Production	———	5.8772**	6.0798**	6.3595**	7.0932**
WHO Imitation	———	———	.2025	.4823	1.2160
Yes/No Imitation	———	———	———	.2798	1.0134
WH-Inverted Imitation	———	———	———	———	.7337

Table 4

Newman-Keuls Comparison of Means (Q Values)

for Sentence Type by Modality

	WH-Inverted Negative	WH-Inverted Positive	WHO, Yes/No* Positive	WHO Negative
Yes/No Negative	.9523	4.3247**	5.2691**	6.8903**
WH-Inverted Negative	———	3.3724*	4.3167**	5.9379**
WH-Inverted Positive	———	———	.9444	2.5656
WHO, Yes/No* Positive	———	———	———	1.6212

*Note: the values for WHO Positive and Yes/No Positive are identical.

Table 5

Newman-Keuls Comparison of Means (Q Values)

for Sex by Age

	Male 3.0-3.5	Male 3.5-4.0	Female 4.0-4.5	Female 3.5-4.0	Male 4.0-4.5
Female 3.0-3.5	1.9617	4.9286**	7.5714**	8.6494**	9.7358**
Male 3.0-3.5	———	2.9669**	5.6097**	6.6877**	7.7741**
Male 3.5-4.0	———	———	2.6428	3.7208**	4.8072**
Female 4.0-4.5	———	———	———	1.0780	2.1644
Female 3.5-4.0	———	———	———	———	1.0864

Figure 1

Sentence Type by Task

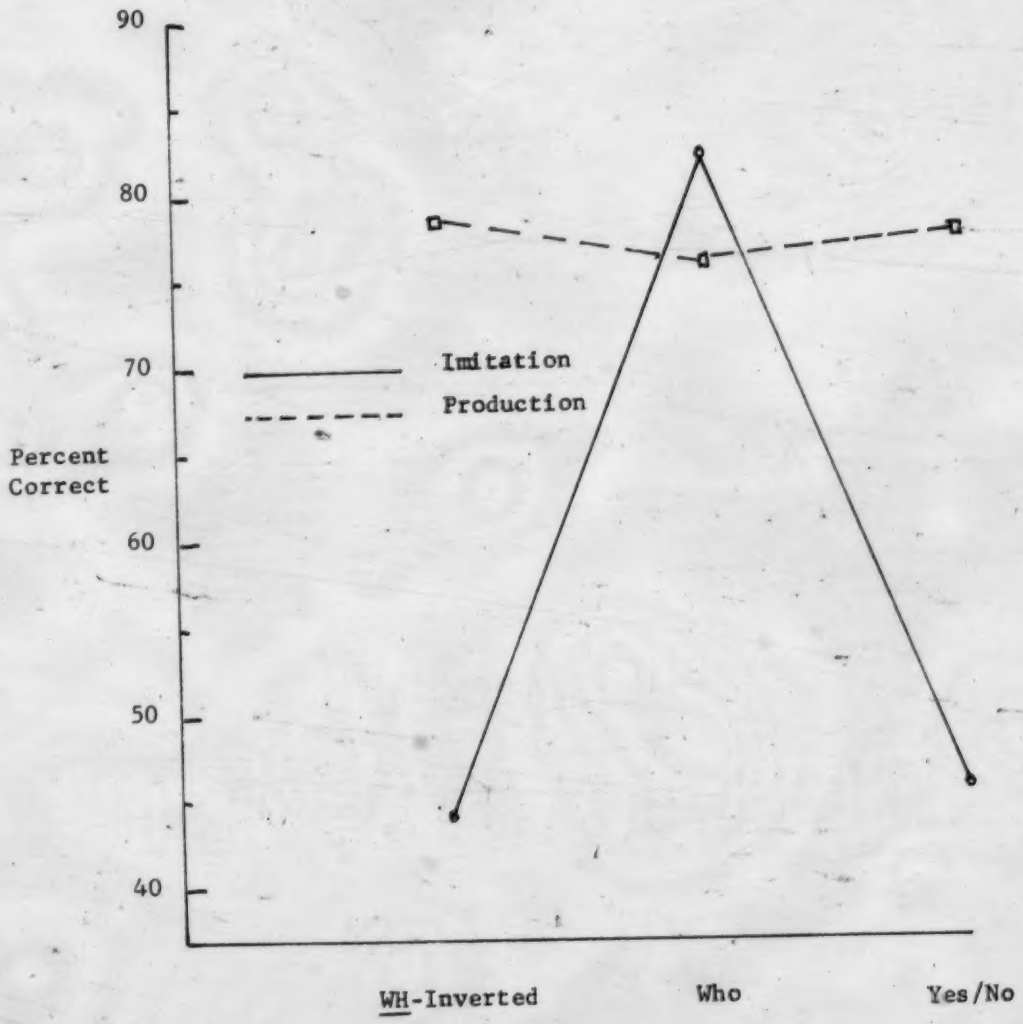


Figure 2

Sentence Type by Modality

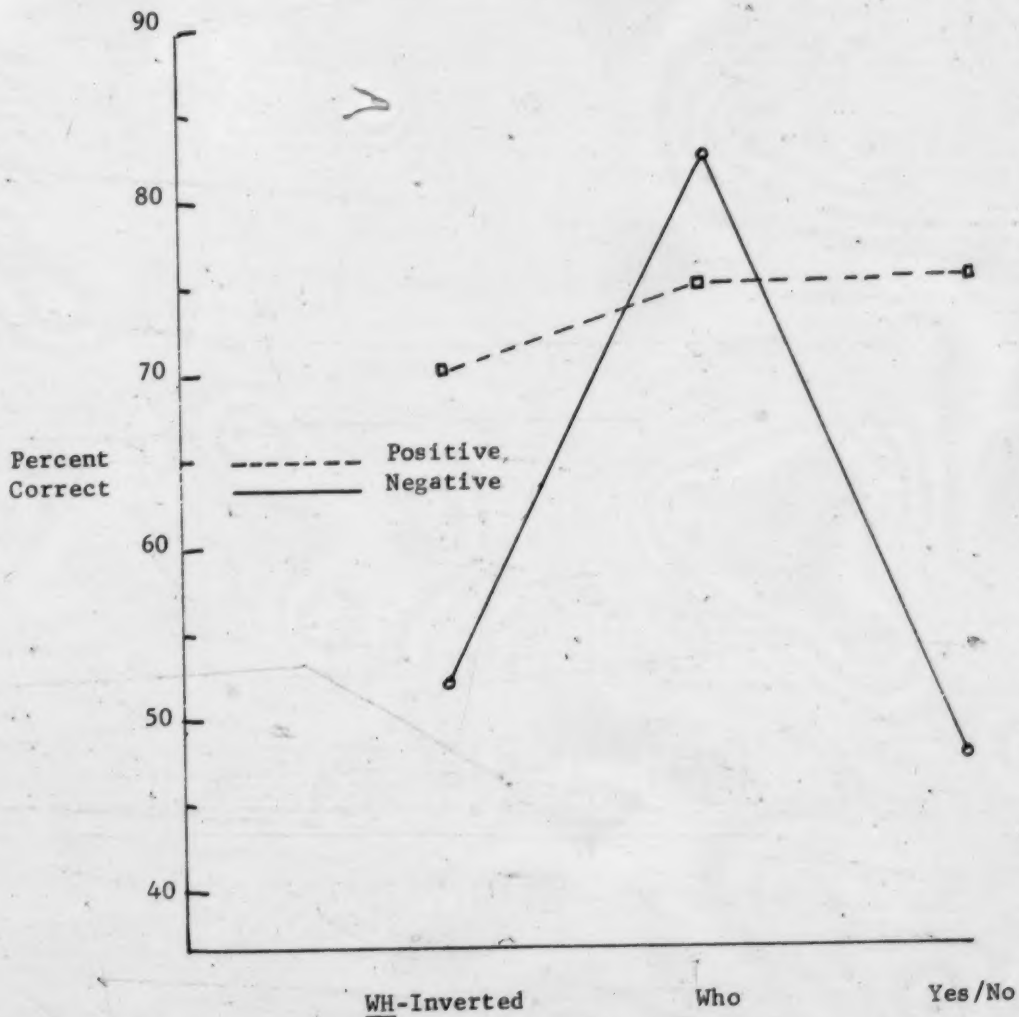
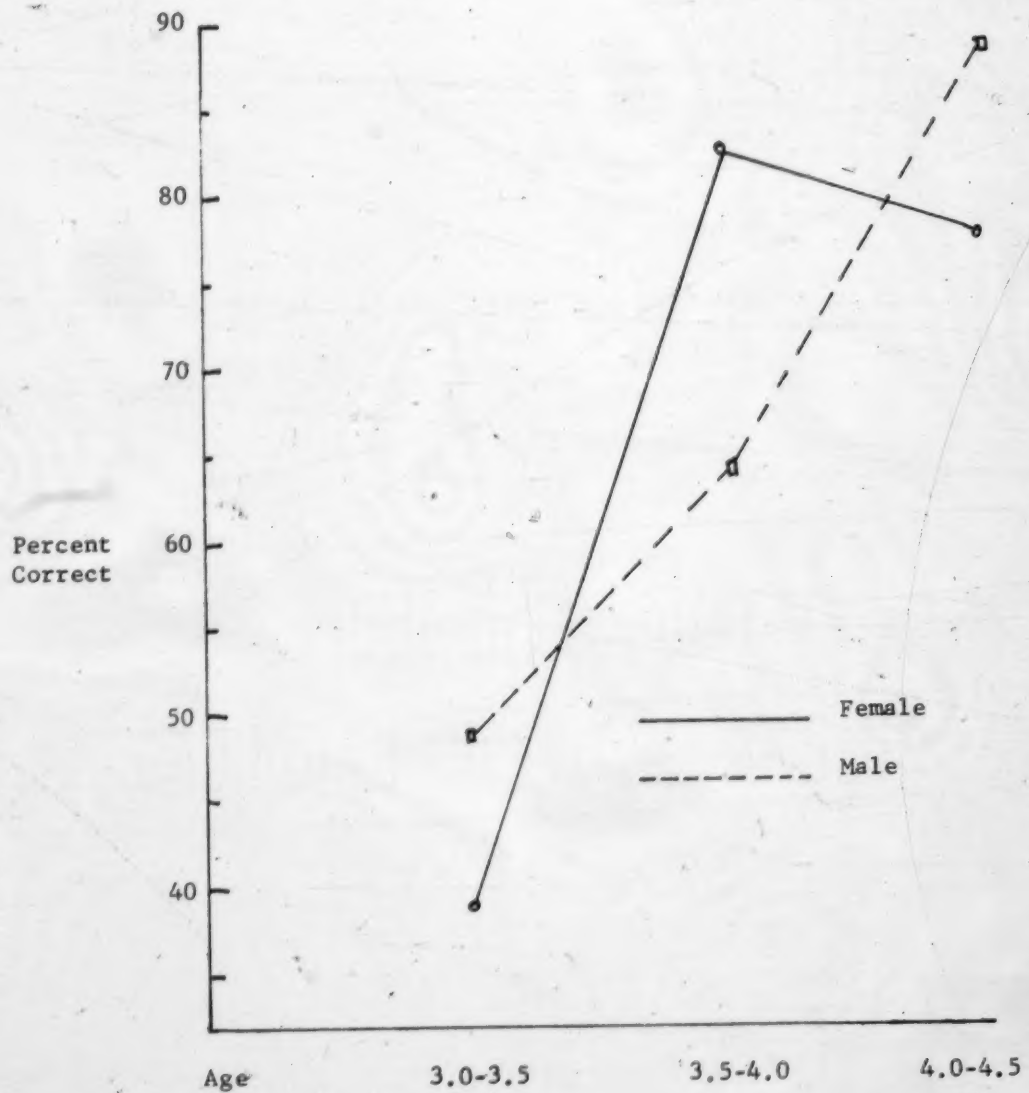


Figure 3

Sex by Age



inverted and Yes/No questions are proportionately more difficult in the negative. The non-inverted WH (who) results are essentially the same for both affirmative and negative sentences. As indicated by the studentized range statistic ($Q(216)=4.06$, $p<.01$), the children found the affirmative questions significantly easier than their negative counterparts.

3. Sex by Age Interaction. The Newman-Keuls comparison of means for this interaction is presented in Table 5. As can be seen from Figure 3 on p. 48, the females in age group 2 performed significantly better than the corresponding males; in fact, the Group 2 females performed at essentially the same level as both sexes in Group 3. This is undoubtedly a mere accidental sampling imbalance, as there was no overall difference in performance between the sexes.

Some interesting observations can also be made concerning the main effect of age. For one thing, performance tended, in general, to improve with age. The cell means for age are .44 for Group 1, .72 for Group 2, and .84 for Group 3, though only the first of these is significantly different from the other two ($Q(216)=8.23$ and $Q(216) = 10.85$, respectively). A linear trend analysis performed on the age groups also revealed a highly significant linear trend ($F(1,216)=58.88$); the quadratic trend is also significant ($F(1,216)=5.19$, $f<.05$). These results show that the youngest group of children found the

task significantly more difficult than the older children did, but an age-dependent ceiling effect was operative as the older children approached complete mastery of the structures.

The main findings of the experiment can thus be summarized as follows: imitation was generally better than production, performance generally improved with age, negatives were more difficult than affirmatives, and inverted structures (both Yes/No and inverted WH questions) were more difficult than non-inverted structures (i.e., who questions). These last two findings bear further discussion in light of some of the theoretical issues raised in Chapter Two.

4.2 Discussion.

The central aim of this thesis was to determine whether or not negative WH questions did in fact develop at a later stage than their affirmative counterparts, as Bellugi (1971) asserted on the basis of very fragmentary data. The findings reported here demonstrate that there is indeed a period during which the child has mastered inversion for affirmative WH questions but has not yet done so for comparable negative questions. As a check on the adequacy of the rather "global" scoring method employed in this study, a separate tabulation was made of the inversion errors for the three sentence types and it was discovered

that the basic findings remained unchanged. This indicates that the original scores accurately reflect the inversion problem itself and not some extraneous error type.

It is often the case that a report of a finding based on very little evidence is adopted as unchallenged fact as soon as it appears in print, particularly if the finding in question tends to support some popular or noncontroversial theoretical position. The study at hand is therefore important in that it serves to provide a considerably broader data base upon which to establish claims related to the acquisition of negative WH questions. We can now much more confidently report that negative WH questions are acquired later than affirmative WH questions. But just how can this lag be explained? Bellugi tried to account for her results in terms of increased syntactic complexity associated with the negative WH question, though she fails to specify the full details (1971, pp. 101ff.). It is clear, however, that her transformationalist stance forces Bellugi into the rather uncomfortable position of having to concoct her explanations in terms of some kind of additive, syntax-based theory (such as the generally discredited derivational theory of complexity). For her, therefore, the relative difficulty of WH questions is viewed as a consequence of bringing together two syntactic processes which the child must initially master in isolation (namely, negation and inversion).

If the semantic nature of the questions is considered, however, a very different interpretation of the lag time results. For the most part, negative WH questions are restricted to very closely defined contexts, such as irony and repetition prompt, both of which involve rather subtle and sophisticated communication skills. Consider, for example:

1. Who isn't going?
2. Who isn't going?

The first of these sentences (with sentence-stress on the underlined constituent) is likely to be used and interpreted as an ironical commentary on what the speaker, at least, regards as a somewhat over-large number of travelers, while the second (distinguished from the first only by intonation and context) is appropriate when the speaker has been given the name of a specific non-traveler, but has failed to hear it and wants to have it repeated to him. It is extremely doubtful that the young child still struggling with the basic syntax of his language would be addressed with very many utterances of this kind, or would have much use for them himself even if he knew how to construct them properly. Only negative questions involving either who or why approach the simple forms of discourse that characterize Motherese, and the first of these is non-inverted. The child is forced to rely, therefore, almost exclusively on the occasional negative why question in order to develop his rule for this sentence type, and this factor alone would seem to be

sufficient to account for the relatively late development of such forms.

Furthermore, it must also be remembered that the child's chief motivation in learning a language is to enable him to communicate, and getting one's intended meaning across is the paramount goal of communication, even if syntactic precision is sacrificed in the process. Certainly the notion of a performance limit or complexity constraint is a reasonable explanatory vehicle, but only if function and context are taken into account. Additional support for the hypothesis that the production of negative WH questions is governed more by semantic than by syntactic considerations can be found in the article, "Grammatical properties of sentences as a basis for concept formation" (Baker, Prideaux & Derwing, 1973). In the study reported there, subjects were directed to classify sentences according to their syntactic categories. Yet even in the experimental situation where the subjects were explicitly asked to attend to syntactic features, their performance revealed that they persisted in utilizing semantic strategies (see especially pp. 213-215 of that paper). In other words, form was found to be secondary to function even in the controlled and rather artificial experimental setting.

The second important finding to emerge from the present experiment was unexpected and somewhat surprising, in that

it contradicted the earlier studies of Klima and Bellugi (1966), Bellugi (1971), and Brown (1973), all of which, it should be noted, were based on the same corpus of naturalistic data from the same three children (particularly Adam). The results of the present study seem to indicate that Yes/No and WH-inverted questions develop at almost exactly the same rate, since there are no significant differences between the two types at any point. (Non-inverted WH questions were, of course, mastered much earlier than either of the inverted types.) Each of the prior studies mentioned reported that the inversion in Yes/No questions appeared simultaneously with the emergence of auxiliaries in the child's system, while WH questions developed inversion only much later.

Bellugi's (1971) discussion of this finding is supported by the data which are presented in Table 1, p. 26 above. To say that her data are unbalanced would be a vast understatement, at best. Of particular interest here are the figures for negative Yes/No questions: Bellugi has no record at all of non-inverted forms and only three inverted cases appear (in contrast to 198 inverted affirmatives!). Though Bellugi says that some of her data sets are "small" (p. 101), she does not mention this heavy imbalance and says nothing about negative Yes/No questions whatsoever. It is somewhat curious that Bellugi should have collected experimental data to supplement the scanty naturalistic information on the lag time for inversion between

affirmative and negative WH questions, while at the same time this almost total lack of data for negative Yes/No questions escaped her notice and, apparently, her interest. Without additional empirical support, therefore, Bellugi's interpretation of her data is totally unconvincing.

Another suspicious aspect of Bellugi's data emerges in connection with her comments regarding the occurrence of the "mixed" forms (e.g., Did I didn't mean to? and What shall we shall have?). As already noted in Chapter Two, Bellugi reported that these constructions were so rare as not to be worthy of serious consideration. In the present study, however, such mixed forms were quite frequent; they occurred in response to seven of the fourteen stimulus sentences, for example, and even more interesting, perhaps, ten of the twenty-four subjects utilized a mixed form at least once. The fact that there is supporting naturalistic evidence to indicate that the mixed forms are not at all uncommon (cf. Hurford, 1975; Kuczaj, 1976), also argues against any any attempt to attribute the present finding to experimental artifact.

There are at least three possible explanations for the occurrence of the mixed form, any or all of which may be operating at any given time. Prideaux (1976), for example, has posited a pair of rules ("surface structure generalizations") which describe the proper positioning of (1) the main verb in all sentences and (2) the first

auxiliary verb in questions. He views the mixed form as a transitional stage in which both rules are employed and the "adult generalization of ellipsis of repeated auxiliaries" (p. 421) has not yet been learned. A second explanation is proposed by Kuczaj (1976), who suggested that the child who has not analysed *what's* as *what* plus *is* is not copying the auxiliary from one position to another when he produces a mixed form. Such a child is instead simply using *what's* as a variant of *what*. A third possibility for explaining the mixed form is that the child may have formulated a tentative rule for asking *WH* questions which involves placing the sequence *WH* + *AUX* in sentence-initial position, followed by the full form of the statement that he intends to question (e.g., *Why do* + *You can't go that way* to yield the question *Why do you can't go that way*?). It seems reasonable to suggest that each of these alternative surface structure explanations may be operating alone, in conjunction with, or even in competition with the others to result in the production of mixed forms. Data which Bellugi dismissed as "not frequent enough to discuss in detail" (1971, p. 98) may thus prove to be a rather rich source for new theoretical development, once one's sights are raised beyond the rigid and very arbitrary confines of transformational-generative grammar.

Bellugi, of course, is constrained to explain the late acquisition of inversion in *WH* questions in transformational terms. She claims that *WH* questions are syntactically more

complex than Yes/No questions because they involve a WH word and two transformations (subject-auxiliary inversion and WH preposing), as opposed to rising intonation and only one inversion rule for the Yes/No interrogatives. We saw in Chapter Two, however, that another aspect of this standard transformational treatment of WH questions is the notion that the "occasional question" (in which the WH word appears in sentence-final position, e.g., You did what?) represents the approximate underlying base structure of WH questions, and we have already seen that this concept is highly suspect. In addition, Prideaux (1976) has argued convincingly that functionally based surface generalizations predict certain aspects of language development far more satisfactorily that do deep structure and "movement rule" analyses. He has proposed that since since a WH word invariably appears in sentence-initial position in WH questions, the child should be able to extract this surface regularity very early. This expectation is borne out by evidence from Brown (1968) and several others that the first and most frequent question children produce is What dat?, and by evidence that both rising intonation (an invariant concomitant of Yes/No questions) and initial WH words appear very early in the child's acquisition of questions (Klima and Bellugi's period 1).

Following these very early developments, there is little change in either question type until Klima and Bellugi's period 3, at which point the limited data suggest

that Yes/No inversion appears prior to inversion in WH questions. If, as Prideaux as claimed, there is no WH word preposing rule (and the previously discussed non-occurrence of occasional questions suggests that his analysis is correct), then Bellugi can offer no explanation at all for this lag. If it is Bellugi's data that are at fault in this controversy, and the data presented in this study are correct, then no theoretical problem arises to explain the simultaneous development of correct auxiliary placement in both Yes/No and WH questions (though for a time a mixed form resulting from conflicting surface strategies may appear, as discussed above).

Despite the fact that the data introduced here were collected from a much larger and therefore more representative sample of the general population than were those of Bellugi, a number of considerations still remain which warrant assuming a guarded posture. In the first place, the present study presents very little data on Yes/No questions (only one positive and one negative example were tested), since the comparison of Yes/No and WH interrogative types was not the original focus of the study. In addition, some of the elicitation cues in the production task were rather awkward and unnatural, perhaps unavoidably so (e.g., Ask the lady where the dog isn't). Most compelling of all, however, is the fact that Maratsos and Kuczaj (1974) have supplemented the Roger Brown corpus (on which Bellugi, 1971, is based) with some new experimental evidence to the effect

that there actually is a difference in acquisition time for these two basic question types.

In the Maratsos and Kuczaj study, the subject (a two-year-old boy) was asked to imitate a large number of sentences containing modal auxiliaries, a constituent-type which had not yet appeared in his spontaneous speech. The stimulus set consisted of affirmative declaratives and both Yes/No and WH questions, and each category included both grammatical and ill-formed examples. At the first session the child was able to imitate grammatical declaratives correctly, while he also normalized or "corrected" the ungrammatical declaratives (e.g., he changed a nice cow eat will the good hay to a nice cow will eat the good hay). His competence did not yet extend, however, to either Yes/No or WH questions. The boy was tested again when he regularly produced modal auxiliaries in spontaneous declarative sentences, but still had not used them in either question-type. Again, the stimulus items were a mixture of well-formed and ungrammatical strings. The subject was now able to imitate grammatical Yes/No questions correctly, and he also normalized nine of the ten ungrammatical utterances in this category. His responses to the WH question task are of particular interest here, however, since, for the first time in the study, the boy's "imitations of ungrammatical sentences were more often correct that his imitations of grammatical sentences" (p. 72). Furthermore, the ungrammatical forms correctly repeated were ill-formed in

precisely the way that Bellugi's (1971) data suggested: there was no subject-auxiliary inversion. The child altered the well-formed WH question by either omitting the auxiliary or by locating it in the uninverted position. (For example, stimuli such as where the little boy's mommy will bake chocolate cookies? were repeated essentially as presented, whereas items like what can a skinny snake wiggle really fast? were repeated as what a skinny snake can wiggle really fast?).

These results would seem to indicate the existence of a viable "preorganization" stage at which the child has a fairly clear understanding of how a given process works - in this case the use of auxiliaries in declarative and later interrogative sentences - prior to the stage at which he actually makes use of this knowledge to produce the forms. They also indicate a clear-cut developmental ordering in the acquisition of the correct use of auxiliaries in the three sentence-types tested: declaratives > Yes/No questions > WH questions. This latter finding was further substantiated by the child's spontaneous productions many weeks later.

It is quite true that the subject samples involved in the Bellugi (1971) and Maratsos and Kuczaj (1974) studies are still extremely small, as a total of only four children are involved. Nonetheless, the fact that, together, these two studies provide confirmatory longitudinal evidence from both naturalistic and experimental sources lends

considerable credence to the claim that auxiliary inversion occurs somewhat later in WH questions than in Yes/No questions, despite the fact that it conflicts with some of the broader-based (but non-longitudinal) data provided by this study. Until more extensive experimentation involving a reasonably large sample of subjects is undertaken, it will be impossible to decide conclusively which data set more accurately reflects the true state of affairs with respect to these two types of questions. (One possibility not previously considered, in fact, is that there may be no single answer which holds true for all English-speaking children, but rather a variety of developmental patterns.)

Despite the foregoing - and even despite the untenability of Bellugi's putative explanation for the priority of Yes/No to WH questions - there are still at least two other reasons for believing that the findings of Bellugi, Maratsos, and Kuczaj may very well describe the correct state of affairs for at least one large component of the English-speaking population. First, as Bellugi notes, once auxiliaries emerge in language development, they are almost immediately inverted in Yes/No questions. This fact is rather an embarrassment from the standpoint of her theory, since if the transformational analysis were correct "one might expect that the non-inverted questions would occur in child speech before inverted questions, but this does not seem to be the case" (p. 97). She is naturally surprised by the sudden development of inversion, since she

considers non-inverted and inverted Yes/No questions to be equivalent even to the extent that they "convey the same information" (p. 98). In actuality, there is a crucial functional difference between the two sentence types. The non-inverted question is "contextually motivated" (cf. Smyth, 1977) in the sense that it is appropriate only in "given" situations where the speaker wants confirmation of information he has already received. For example:

Speaker 1: Joe just finished reading <u>The embedding</u>.

Speaker 2: He reads science fiction?

The inverted Yes/No question, on the other hand, is unmarked for context and can be used in both "given" and "new" situations. For instance, the question, <u>Does Joe like science fiction</u>?, is suitable with or without previous information regarding Joe's reading habits.

The reason children use inverted Yes/No questions as soon as auxiliaries emerge in their speech, therefore, may well be that the unmarked form is much simpler semantically than its non-inverted, marked counterpart and is clearly the most generally appropriate way to ask a Yes/No question.

Finally, Prideaux (1976) has suggested that the late occurrence of inverted <u>WH</u> questions can also be explained in functional terms. He points out that non-inverted <u>WH</u> questions are perfectly understandable and that the inversion is, for the young child, a syntactic aberration

without a semantic basis. However, once relative clauses emerge in the child's system, the inversion serves a semantic function that it did not previously have, namely, to distinguish questions from the newly-acquired relative clauses.

Both of these theories point in the same direction, the first by predicting the early development of inversion in Yes/No questions and the second by predicting the relatively late development of inversion in WH questions. Both thus conform to Bellugi's original findings on this issue, yet serve to explain them in contextual or functional rather than purely syntactic terms.

4.3 Conclusions.

The original aim of this thesis, to determine whether, in fact, negative WH questions develop later than positive WH questions has been fulfilled. In addition, some interesting new information regarding the sequence of development of Yes/No and WH questions has also surfaced. These data conflict with earlier reports based on very small numbers of subjects. Since, as has been shown, reasonable functionally-motivated theories can be constructed to account for either of the alternatives, the next step is to collect an extensive body of data through experimentation directed specifically at this problem in order to resolve the issue on a firm empirical basis.

REFERENCES

Baker, W.J., Prideaux, G.D., & Derwing, B.L. Grammatical properties of sentences as a basis for concept formation. Journal of Psycholinguistic Research, 1973, 2, 201-220.

Bellugi, U. Simplification in children's language. In R. Huxley & E. Ingram (Eds.), Methods and models in language acquisition. New York: Academic Press, 1971, 95-117.

Bellugi, U., & Brown, R. Three processes in the child's acquisition of of syntax. Harvard Educational Review, 1964, 34, No. 2, 133-151.

Bloom, L.M. Language development: Form and function in emerging grammars. Cambridge, Mass.: M.I.T. Press, 1970.

Brown, R. The development of WH questions in child speech. Journal of Verbal Learning and Verbal Behavior, 1968, 7, 277-290.

Brown, R. A first language: The early stages. Cambridge,

Mass.: Harvard University Press, 1973.

Brown, R. Development of the first language in the human species. American Psychologist, 1973, 28, 97-106.

Brown, R., Cazden, C.B., & Bellugi, U. The child's grammar from I to III. In J.P. Hill (Ed.), Minnesota symposium on child psychology. (Vol. 2). Minneapolis: University of Minnesota Press, 1969, 28-73.

Brown, R., & Hanlon, C. Derivational complexity and the order of acquisition in child speech. In J.R. Hayes (Ed.), Cognition and the development of language. New York: Wiley, 1970.

Bushnell, E.W., & Aslin, R.N. Inappropriate expansion: a demonstration of a methodology for child language research. Journal of Child Language, 1977, 4, 115-122.

Cazden, C.B. Environmental assistance to the child's acquisition of grammar. Unpublished Ph.D. dissertation, Harvard University, 1965.

Chomsky, N. Syntactic structures. The Hague: Mouton, 1957.

Chomsky, N. Aspects of the theory of syntax. Cambridge,

Mass.: M.I.T. Press, 1965.

Ervin-Tripp, S. Discourse agreement: how children answer questions. In J.R. Hayes (Ed.), Cognition and the development of language. New York: Wiley, 1970, 79-107.

Ervin-Tripp, S. The comprehension and production of requests by children. Papers and Reports on Child Language Development (Stanford University), 1974, 8, 188-196.

Fodor, J., & Garrett, M. Some reflections on competence and performance. In J. Lyons & R. Wales (Eds.), Psycholinguistics papers. Edinburgh: Edinburgh University Press, 1966, 135-154.

Foss, D.J., & Hakes, D.T. Psycholinguistics: An introduction to the psychology of language. Englewood Cliffs, N.J.: Prentice-Hall, 1978.

Fraser, C., Bellugi, U., & Brown, R. Control of grammar in imitation, comprehension, and production. Journal of Verbal Learning and Verbal Behavior, 1963, 2, 121-135.

Garrett, M., & Fodor, J. Psychological theories and linguistic constructs. in T. Dixon & D. Horton

(Eds.), Verbal behaviour and general behaviour theory. Englewood Cliffs, N.J.: Prentice-Hall, 1968, 451-477.

Hurford, J.R. A child and the English question formation rule. Journal of Child Language, 1975, 2, 299-301.

Ingram, D. The acquisition of questions and its relation to cognitive development in normal and linguistically deviate children: a pilot study. Papers and Reports on Child Language Development (Stanford University), 1972, 4, 13-18.

Klima, E.S., & Bellugi, U. Syntactic regularities in the speech of children. In J. Lyons & R.J. Wales (Eds.), Psycholinguistics papers. Edinburgh: Edinburgh University Press, 1966, 183-208.

Kuczaj, S.A. II. Arguments against Hurford's 'Aux Copying Rule.' Journal of Child Language, 1976, 3, 423-427.

Limber, J. The genesis of complex sentences. In T.E. Moore (Ed.), Cognitive development and the acquisition of language. New York: Academic Press, 1973, 169-185.

Lord, C. Variations in the pattern of acquisition of negation. Papers and Reports on Child Language Development (Stanford University), 1974, 8, 78-86.

Macnamara, J. Cognitive basis of language learning in infants. Psychological Review, 1972, 79, 1-13.

Maratsos, M.P., & Kuczaj, S.A. II. Evidence from elicited imitation for preproductive competence in a grammatical system. Papers and Reports on Child Language Development (Stanford University), 1974, 8, 65-77.

McCarthy, D. Language development in children. In L. Carmichael (Ed.), A manual of child psychology. (2nd ed.) New York: Wiley, 1954, 492-630.

McNeill, D. The creation of language by children. In J. Lyons and R.J. Wales (Eds.), Psycholinguistics papers. Edinburgh: Edinburgh University Press, 1966, 102-110.

McNeill, D., & McNeill, N.B. What does a child mean when he says "no"? In C.A. Ferguson & D.I. Slobin (Eds.), Studies of child language development. New York: Holt, Rinehart & Winston, 1973, 619-627.

Miller, W. The acquisition of grammatical rules by children. In C.A. Ferguson & D.I. Slobin (Eds.), Studies of child language development. New York: Holt, Rinehart & Winston, 1973, 380-381.

Newport, E.L., Gleitman, L.R., & Gleitman, H. A study of

mothers' speech and child language acquisition. Papers and Reports on Child Language Development (Stanford University), 1974, 8, 111-116.

Prideaux, G.D. A functional analysis of English question acquisition: a response to Hurford. Journal of Child Language, 1976, 3, 417-422.

Prideaux, G.D. The acquisition of English relative clauses: a functional analysis. Forthcoming in The Canadian Journal of Linguistics, 1979.

Savíc, S. Aspects of adult-child communication: the problem of question acquisition. Journal of Child Language, 1975, 2, 251-260.

Shipley, E.F., Smith, C.S., & Gleitman, L.R. A study in the acquisition of language: free responses to commands. Language, 1969, 45, 322-342.

Slobin, D.I. Developmental psycholinguistics. In W.O. Dingwall (Ed.), A survey of linguistic science. Linguistics Program, University of Maryland, 1971, 298-410.

Slobin, D.I., & Walsh, C.A. Elicited imitation as a research tool in developmental psycholinguistics. In

C.A. Ferguson & D.I. Slobin (Eds.), Studies of child language development. New York: Holt, Rinehart & Winston, 1973, 485-497.

Smith, C.S. An experimental approach to children's linguistic competence. In J.R. Hayes (Ed.), Cognition and the development of language. New York: Wiley, 1970, 109-133.

Smyth, R.H. Context effects in memory for information focus: An experimental study of English cleft and dative sentences. Unpublished M.Sc. thesis, University of Alberta, 1977.

Suppes, P. Syntax and semantics of children's language. In S.R. Harnad, H.D. Steklis, & J. Lancaster (Eds.), Origins and evolution of language and speech, Annals of the New York Academy of Sciences (Vol. 280). New York: The New York Academy of Sciences, 1976, 227-237.

Tyack, D., & Ingram, D. Children's production and comprehension of questions. Journal of Child Language, 1977, 4, 211-224.

Winer, B.J. Statistical principles in experimental design, (2nd ed.) New York: McGraw-Hill, 1971.